Implementation of Green Tourism Concept through a Dynamic Programming Algorithm to Select the Best Route of Tourist Travel

by Aries Susanty

Implementation of Green Tourism Concept through a Dynamic Programming Algorithm to Select the Best Route of Tourist Travel

Aries Susanty[1], Nia Budi Puspitasari[2], Singgih Saptadi[3], Sidiq Prasetyo[4]
Industrial Engineering Department, Diponegoro University, Indonesia
ariessusanty@gmail.com; niabudipuspitasari@gmail.com; singgihs@gmail.com;
mochammadp@gmail.com

Abstract. The main objectives of this study are to find out how the tourist travel can minimize emission of CO2 by choosing the right and the shortest route to the zone or area where he or she will be the tour. The shortest route is found by investigating a selection of routes from the starting point to the terminal point. In this study, dynamic programming is used in solving the problem of a tourist travelling from eleven district in Central Java Province (Banyumas, Brebes, Cilacap, Kebumen, Pati, Pekalongan, Pemalang, Semarang, Tegal, Yogyakarta, and Surakarta) to Borobudur Temple, so as to find the optimal distance for the tourist's trip which in turn, can minimize CO2 emission from transportation activity. To find out which roads can be travelled and how far it takes to travel which is adjusted to road conditions, this study collected data from Google Map, Central Java, and Yogyakarta Map. The result of data processing with dynamic programming indicated several shortest route from eleven districts in Central Java Province to Borobudur Temple., i.e. Banyumas - Banjarnegara – Magelang (the location of Borobudur Temple) (150.5 km), Brebes - Tegal - Pekalongan - Batang - Temanggung – Magelang (268.5 km), etc.

Keywords – Borobudur temple; dynamic programming; shortest route; tourist travel

1. Introduction

The activity of tourism is consist of the hospitality and accommodation sector, the transportation sector, and entertainment sector with visitor attractions, such as museum, amusement parks, sports facilities, etc. The activity of tourism can be seen as the system which contains some process and procedure and at the level of industry, the activity of tourism is including planning, organizing, coordinating, training and monitoring-evaluating at various levels (international, national, regional, local) [1]. Moreover, there is no single definition of tourism and it is also difficult to find one definition of tourism that covers all aspect of tourism. According to OECD in 1991, tourism is a concept that can be understood in a different way depending on the situation [2]. World Travel and Tourism Council in 1995 [3] defined tourism as the actions of persons traveling to and staying in places outside their usual environment for no more than one consecutive year for business, leisure, and another purpose; while at the same time, World Tourism Organization in 1996 stated that tourism is thus a rather general term, which can refer to the consumption of tourists, to the production units supplying goods and services particularly to tourists, or even to a set of legal units or of geographical areas related in a way or other to tourists [4]. More recently, McDowall and Choi in 2010 states that tourism is in the business of selling unforgettable experiences, and these experiences are made up of the dissimilar products and services that tourists meet for the period of their travel and stay at a destination [5].

Whatever the definition of tourism, tourism has come to be one of the major industries in the world and can be considered as an economic sector [6]. The tourism industry is growing fast internationally and regionally, and also have a significant direct effect on several aspects such as economic, environmental and social [7]. Tourism is one of the fastest-growing sector and occupy ranked third in the world economy, after oil and automobiles [8]. The World Tourism Organization (UNWTO) in 2017 indicated that international tourist arrival worldwide grew by 6% in January-April 2017. It is reaching the highest level in this decade comparing to the same period last year. In Asia and the Pacific, the international arrivals can describe as follow. In South Asia, international tourist arrival grew by 14% in January-April 2017, followed by Oceania 7%, South-East Asia 6%, and North-East Asia 5% [9].

More specifically, in Indonesia, the tourism industry is one of the major contributors of economic growth as a study conducted by Othman and Salleh who find that the relationship between tourism development and economic growth [10]. In 2013, according to the Ministry of Tourism, tourism sector ranked fourth in the category of foreign exchange after palm oil, coal, oil, and it produced 10,054.1 (in million USD). The Ministry also published, that in 2014, tourism sector attracted around 9,435,411 visitors. The tourism industry has contributed the significant share of GDP and employment. The direct contribution of Travel and Tourism to Indonesia's GDP in 2016 was 16,771.1 (in million USD) (1.8% of GDP). This is forecast to rise by 4.3% to 17,496.5 (in million USD) in 2017. This mainly reveals the activity of economic created by industries such as travel agents, hotels, airlines and other traveller transportation The direct impact of Travel and Tourism on GDP of Indonesia is probable to increase by 5.6% pa to 30,072.2 (1.9% of GDP) by 2027. Travel and Tourism generated 1,944,000 jobs in 2016 (1.6% of total employment) and this is estimate to increase by 1.7% in 2017 to 1,977,500 (without commuter services). It also consist of, for example, the restaurant and leisure industries' activities which is directly supported by tourists. By 2027, Travel and Tourism will provide 2,517,000 jobs directly, grow of 2.4% p.a. for the next ten years [11].

Related to the destination of tourism in Indonesia, there were seven sites that were acknowledged by UNESCO and the world as a world heritage sites, and one of the most widely known is Borobudur temple. According to the Magelang Tourism Office, the total of domestic visitors to the Borobudur Temple in 2010 until 2015 was 2,283,532, 1,949,817, 2,830,230, 3.148,368, 3,159,788, and 3.302,328 respectively; whereas the total of foreign visitors to Borobudur temple was 156,247, 168,028, 193,932, 227,337, 268,664, and 256,362 respectively. Total domestic and foreign visitors to Borobudur increase 4% from 2014 to 2015. The forecast of the domestic visitor to Borobudur Temple in 2026 is 3,897,400 and the foreign visitor is 328,400 [12]. The increasing number of visitors can give negative impact to the Borobudur Temple. According to reference [13], the impacts of tourism can be differentiated into three groups, namely direct impact, upstream impact, and downstream impact. Including direct impact is the impact of tourist travel to a destination, activities of tourist at the destination, and maintenance facility that caters to the tourist. The upstream impact results from travel service providers or "ability to influence suppliers" and downstream impact results from the ability of service provides to affect the behaviour or patterns of consumption of tourist. Among three categories of negative impacts of tourism, this study only focuses on direct impact, specifically the impact of tourist travel to the destination which contributes to the air pollution through emission of CO2. In this case, most tourism-related air pollution comes from automobiles [14].

According to the management of state-owned institute PT. Taman Wisata Candi Borobudur (TWC), from 2012-2015, the number of buses and the private car used by domestic tourist to visit Borobudur have increased by an average of 7 percent per year to reach 319,280 buses and the private car in 2015. If we assume that most of the tourist to Borobudur was coming from Banyumas, Brebes, Cilacap, Kebumen, Pati, Pekalongan, Pemalang, Semarang, Tegal, Yogyakarta, and Surakarta, then the average of the number of miles driven was about 163.46 km or 101.59 miles. According to U.S. Environmental Protection Agency (EPA), the average passenger vehicle emits about 411 grams of CO2 per mile, so the average of CO2 emission from tourist transportation to Borobudur reached more than 13 billion grams in 2015 or increased by 758,138,994.68 grams per year since 2012. In 2020, the CO2 emission from tourist transportation to Borobudur might reach more than 18 billion grams if the number of growth of domestic tourism which is using a bus and private car increase 7 percent per year. The result of calculation showed that tourism development in Borobudur is unsustainable with respect to climate change as its emissions are probable to raise at 7 percent p.a. and, if not resolved, may possibly turn into larger than the value allowance by the global emission. So, based on the worst condition can happen from the development of tourism in Borobudur Temple, this study aims to identify the best route and type of transportation used by tourist to go to Borobudur using dynamic programming approach. In this case, the best route can be defined as the shorter route from the point of origin to the Borobudur Temple which can minimize the emission of CO2. Basically, determine the best route which can minimize the emission of CO2 is part of implementation concept green tourism in development of Borobudur Temple. Green tourism is a term used to define the best practice of environmental within the tourism sector. Green Tourism is not same with ecotourism as Green Tourism business should make significant efforts to decrease their effect on the environment [15].

2. Literature review

2.1. Green tourism

According to reference [16], the definition of green tourism can be seen in two different perspective. First, green tourism may denote to any action which is carry out in a natural area, on which the main focus is a natural resource. Second, green tourism can be defined as tourism which is considered to be environmentally responsible in nature. In line with reference [16], Furqon et al also see the term green tourism in two purposes [17]. First, green tourism can be used to tell the customers that the holiday destination they are going to is beautiful and un-spoilt [18]. Second, green tourism can be used as the indicator that tourism operations which are occurring in that zone do not damage the environment [19]. In broader scope, Dodd and Joppe differentiate green tourism into four component and one of that components is responsibility of the environmental (conserving, protecting, and increasing nature and the physical environment to make sure the long-term health of the life-sustaining eco-system) [20]. So, related with protecting the physical environment, one recommended strategy for green tourism is mitigating the carbon emission which is resulted from tourism activity. It is including reducing emissions, replacing environmentally destructive practices with more sustainable ones, and selecting sustainably sourced materials and goods [21].

2.2. Emission of CO_2

One of the major contribution of greenhouse gas (GHG) emissions at the global scale is Tourism. It can be happened because of the growing of energy consumption in accommodation, travel, and others activities of tourist and the reliance on fossil fuels. Currently, the contribution of tourism to the CO2 emission is about 5%, however, referring to several scientists, the total impact of tourism to global warming – bearing in mind the radioactive forcing of all greenhouse gases – is about 5.2–12.5% [21]. According to reference [21], emissions from tourism-related transport are depend on two factors, namely transport distances and the average amount of CO2 emitted for transporting one person over one kilometre or averaged emission factors. More detail, according to reference [22], tourism-related transport are depend on four factors. First, the load factor (payload) such as the amount of utilization of the maximum payload capacity of each transport unit. Second, the share of empty running associated with positioning transport equipment to the next loading point. Third, the level of energy efficiency of the vehicle. This is reliant on numerous factors such as characteristics of the vehicle, design of engine behaviour of driving, average speed, condition of traffic, condition of road, topography, etc. Fourth, the carbon intensity of the source of energy i.e. the quantity of CO2 produced per unit of energy consumed, either directly by the vehicle's combustion engine or indirectly for electrically-powered freight operations.

Every transport mode have different averaged emission factors. In this case, average emission from car reach 0.0193 kg CO2/ passenger kilometre (pkm), while emission from flights of 1,000 or more km reach 0.130 kg CO2/pkm, and emission from short flights of less than 500 km reach 0.206 kg CO2/pkm, emission from coach reach 0.022 kg CO2/pkm, and emission from rail transport reach 0.027 kg CO2/pkm. It seems, the coach and rail transport are the most efficient [22] [24]. In detail, the number of emission of CO2 for car and bus according to the number of passenger can be seen in the following Table 1 [23].

Table 1. Emission of CO_2 from Car and Bus According to the Number of Passenger

Modes of Transportation	Emission of CO_2 (kg CO_2/ vehicle-km)	The number of passenger	Emission of CO_2 (kg CO_2/ pkm)
Car	0.19388	1	0.193880
		2	0.096940
		3	0.064627
		4	0.048470
Bus	0.67440	30	0.022480
		34	0.019835
		40	0.016860
		50	0.013488

Source: Department for Environment, Food & Rural Affairs (DEFRA), 2014

3. Method of research

This study use dynamic programming approach to find the shortest distance between several points of origin to the Borobudur Temple. There are several characteristic of dynamic programming approach.

- In the dynamic programming approach, the problem can be separated into several stages and each stage need a policy decision.
- Each stage has a number of states related with the beginning of that stage. The states indicate the various likely situations in which the system could be at that stage of the problem. The number of states could be either finite or infinite.
- The impact of the policy decision at each stage is to alter the current state become a state of the subsequent stage.
- The procedure of solution is intended to discover an optimal policy for the whole problem, i.e., a prescription of the optimal policy decision at each stage for each of the possible states.
- Given the recent state, an optimal policy for the remaining stages is independent of the policy decisions adopted in previous stages. The solution procedure begins by finding the optimal policy for the last stage.
- A recursive relationship that identifies the optimal policy for stage n, given the optimal policy for stage n+1 is available. In this case,

$$f_n^*(s) = min_{x_n}\{c_{sxn} + f_{n+1}^*(x_n)\} \quad (1)$$

Where:

N = the number of stages; n= label for current stage (n=1, 2, 3,....., N)
s_n = current state for stage n
x_n = decision variable for stage n;
x_n^* = optimal value of x_n,
$f_n(s_n,x_n)$= contribution of stage n, n+1...N to objective function if system starts in state s_n at stage n, immediate decision is x_n and optimal decisions are made thereafter.

4. Result and discussion

In order to identify the region involved in this problem, let us adopt a circle to figure the various region from the point of origin to Borobudur. As seen in Fig 1, the network has eleven points origin with brown, green and yellow colours and one point destination with blue colour, and the distances between regions are marked on the connections. The distances between points are taken from Google Map. It is assumed that there are no direction restrictions. This study aims to find the shortest route between the eleven points of origins to the one point destination. The brown colour in the point origin indicated that the altitude of the path is 1001 – 2000 meter above sea level, the green and yellow colour indicated that the altitude of the path is 401 – 1000 meter and 101- 400 meter above sea level. The altitude of the path is a multiplier factor for mileage, 1.5 for 1001 – 2000 meter above sea level, 1.3 for 401 – 1000 meter above sea level, and 1.1 for 101- 400 meter above sea level.

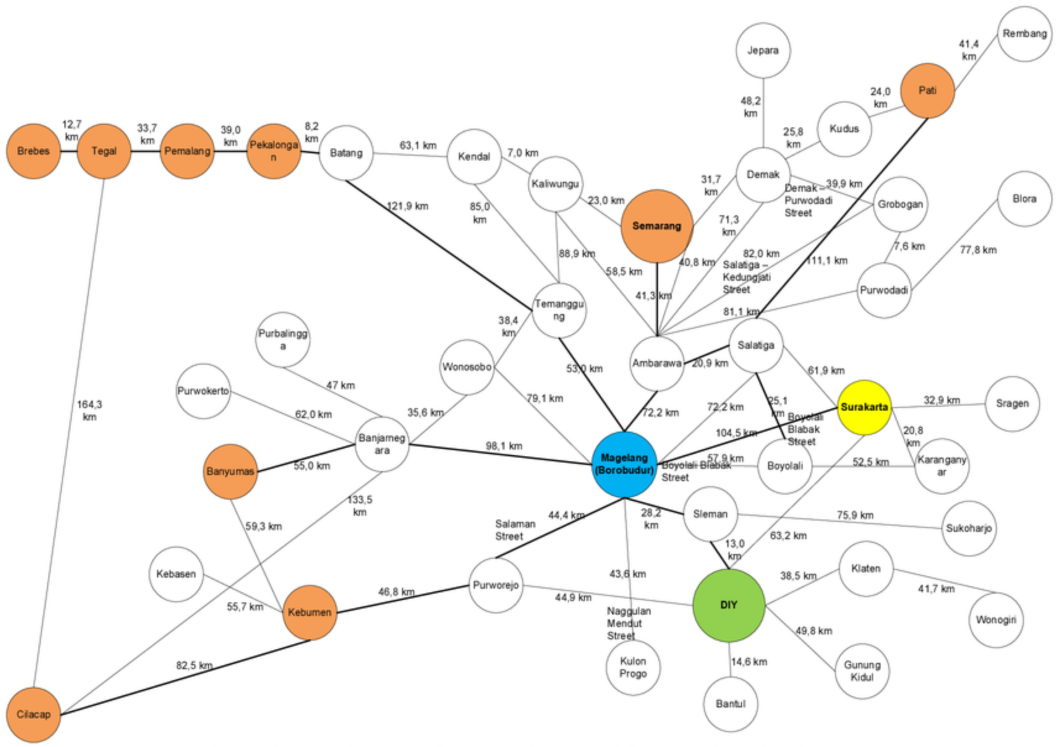

Figure 1. The Distance between Regions that Consider the Altitude of the Route

The example of the calculation

This is the example of calculation from Banyumas region to Borobudur Temple. As seen in Fig 1, there is several route can be chosen by tourist to go to Borobudur Temple from Banyumas region. Based on those several routes, the detail calculation to find the shortest route from Banyumas to Borobudur Temple can be seen as follow

Table 2. Optimization Stage 3 Route Banyumas –Borobudur Temple

S	Optimum Solution	
	f3(s)	*x3*
Wonosobo	79,1	Borobudur Temple
Purworejo	44,4	Borobudur Temple

Table 3. Optimization Stage 2 Route Banyumas –Borobudur Temple

S	x2				
	f2(s,x2)			Optimum Solution	
	Wonosobo	Purworejo	Borobudur Temple	*f2(s)*	*x2*
Kebumen	-	46,8	-	91,2	Purworejo
Banjarnegara	35,6	-	98,1	98,1	Borobudur Temple

Table 4. Optimization Stage1 Route Banyumas –Borobudur Temple

S	x1			
	f1(s,x1)		Optimum Solution	
	Kebumen	Banjarnegara	*f1(s)*	*x1*
Banyumas	59,3	55	150,5	Kebumen

So, the shortest route from Banyumas to Borobudur Temple is through Banyumas – Kebumen – Purworejo – Borobudur Temple (150.5). In the same way, we calculate the shortest route from the ten point of origins to the Borobudur Temple and the result can be seen in Table 5 and Fig. 2.

Table 5. The Shortest Route from Eleven Point of Origins to Borobudur Temple

No	Point of Origin	Shortest Route	Optimal Distance (km)
1	Banyumas	Banyumas - Banjarnegara - Magelang (Candi Borobudur)	150.5
2	Brebes	Brebes - Tegal - Pekalongan - Batang - Temanggung - Magelang (Candi Borobudur)	268.5
3	Cilacap	Cilacap - Kebumen - Purworejo - Magelang (Candi Borobudur)	173.7
4	Kebumen	Kebumen - Purworejo - Magelang (Candi Borobudur)	91.2
5	Pati	Pati - Salatiga - Magelang (Candi Borobudur)	183.3
6	Pekalongan	Pekalongan - Batang - Temanggung - Magelang (Candi Borobudur)	183.1
7	Pemalang	Pemalang - Pekalongan - Batang - Temanggung - Magelang (Candi Borobudur)	222.1
8	Semarang	Semarang - Ambarawa - Magelang (Candi Borobudur)	113.0
9	Tegal	Tegal - Pemalang - Pekalongan - Batang - Temanggung - Magelang (Candi Borobudur)	255.8
10	Yogyakarta	Yogyakarta - Sleman - Magelang (Candi Borobudur)	41.2
11	Surakarta	Surakarta – Magelang (Candi Borobudur)	103.8

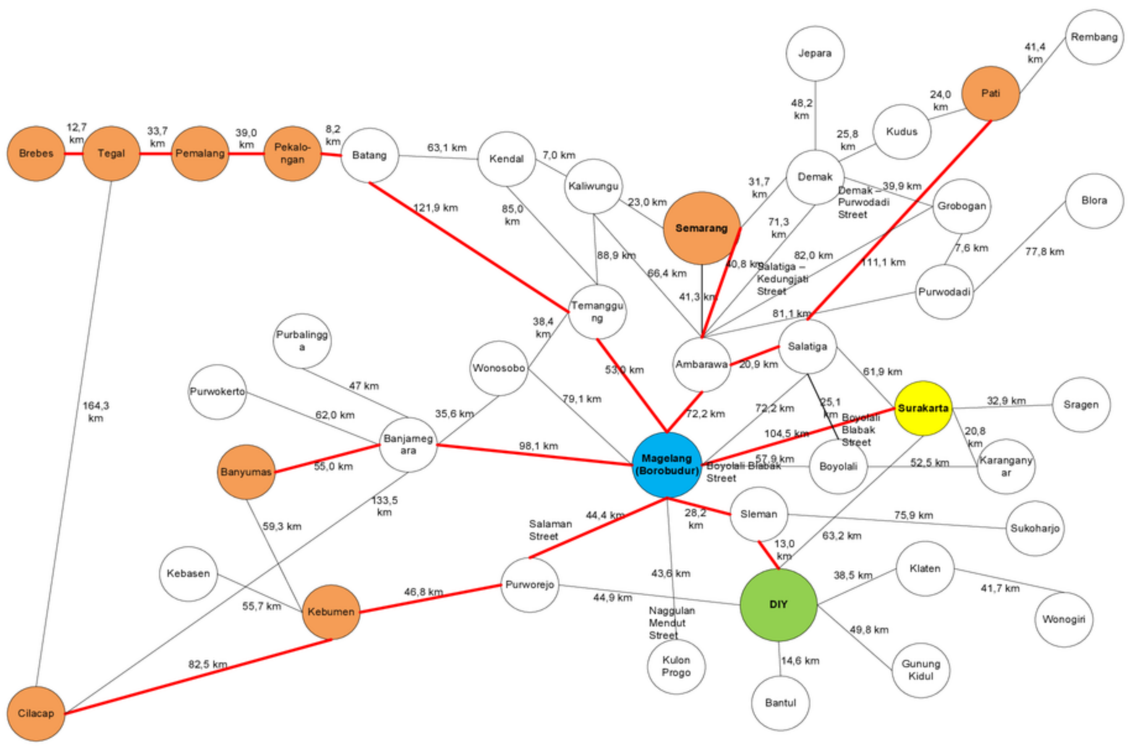

Figure 2. The Shortest Route from Eleven Point of Origins to Borobudur Temple

Compare to Google Maps and Tracpacking.com (site information provider about common route that the tourist usually travel through), only two point of origin (Pati and Surakarta) indicated the different route with the result of calculation. Based on our calculation, the shortest route from Pati is Pati –Salatiga-Borobudur Temple with total distance 183.3 km; whereas, the common route that the tourist usually travel is Pati – Kudus – Demak – Semarang – Ambarawa –Borobudur Temple with total distance ± 194,5 km. Moreover, based on our calculation, the shortest route from Surakarta is Surakarta –Borobudur Temple with total distance 103.8 km; whereas, the common route that the tourist usually travel is Surakarta – Yogyakarta – Sleman – Borobudur Temple with total distance 104.4 km.

Based on the information about the amount of emission of CO_2 from car and bus according to the number of passenger (see Table 1) and also the shortest route from each point of origin to Borobudur Temple (see Table 5), the differences of the amount of emission of CO_2 in kg/passenger km from those two modes of transportation when using the shortest route and when using common route that the tourist usually travel through, can be seen in Table 6. In this case, the calculation uses assumption 1 car contains 4 passenger and 1 bus contain passenger. The amount of emiision of CO_2 from common route is higher than optimal route.

Table 6. The Differences of the Amount of Emission of CO_2 in kg/passenger km from Car and Bus

No	Point of Origin	Common Route (km)	Optimal Distance (km)	CO_2 Emission in kg/ pkm (common route)		CO_2 Emission in kg/ pkm (optimal route)	
				Car	Bus	Car	Bus
1	Banyumas	150.50	150.50	7.29	3.38	7.29	3.38
2	Brebes	268.50	268.50	13.01	6.04	13.01	6.04
3	Cilacap	173.70	173.70	8.42	3.90	8.42	3.90
4	Kebumen	91.20	91.20	4.42	2.05	4.42	2.05
5	Pati	194.5	183.30	9.43	4.37	8.88	4.12
6	Pekalongan	183.10	183.10	8.87	4.12	8.87	4.12
7	Pemalang	222.10	222.10	10.77	4.99	10.77	4.99
8	Semarang	113.00	113.00	5.48	2.54	5.48	2.54
9	Tegal	255.80	255.80	12.40	5.75	12.40	5.75
10	Yogyakarta	41.20	41.20	2.00	0.93	2.00	0.93
11	Surakarta	104.4	103.80	5.06	2.35	5.03	2.33
			Total	**87.15**	**40.42**	**86.58**	**40.15**

Like the other study, this study have several limitation. First, this study only consider about the altitude of the path as correction factor for mileage; this study have not considered the level of road density and also the condition of the road as a correction factor for mileage. So the best route from the eleven point of origin to Borobudur Temple may be change when those factors are included as a correction factor. Second, this study only a preliminary study to know the impact of the tourist travel on emission of CO2. To know more about the impact of tourist travel on emission of CO2, we should describe the tourist travel activities as a system which is consist of the several such system, such as sub-system that describe the growth of domestic and foreign tourist, sub-system that describe the probability of tourist change their preference from private car to public transportation, sub-system that describe the availability of public transportation, and the sub-system that describe the condition of road toward Borobudur Temple. Each sub-system may have several important factor which have a relationship. Moreover, the result from this study can be further processed with system dynamic approach which can find the impacts and outcome of changes on any variable in each sub-system on the level of emission of CO2 reduction.

5. Conclusion

Basically, a central task in many network and analysis of transportation problem is finding the shortest route. This study has been done to develop the shortest route from eleven point of origins (Banyumas, Brebes, Cilacap, Kebumen, Pati, Pekalongan, Pemalang, Semarang, Tegal, Yogyakarta, and Surakarta) to Borobudur Temple. The tourist travel route in the exhibition network may change because of several condition, such as the level road density (related with capacity of the road), the condition of the road, and also the preference of the tourist. So, introducing a concept of green tourism is one of effort to change the preference of the tourist in select the best route and modes of transportation that can reduce the negative impact from their travel activity to environment. The results of our study might be a guideline not only for tourist who travel by roads but also for transporters and for the companies that want to travel to the Borobudur Temple.

6. References

[1] Zaei, M. E., Zaei, M. E. 2013 European J. Tourism Hospitality and Research 1 12.

[2] Franz, A 1991 *OECD Manual on Tourism Economic Accounts (*Paris: Organization for Economic Co-operation and Development)

[3] World Travel and Tourism Council 1995 *Travel & Tourism: A New Economic Perspective* (The 1995 WTTC Report - Research Edition)

[4] World Tourism Organization 1996 *Draft Manual of a Satellite Account for Tourism.* Available at: statistics.unwto.org/sites/all/files/docpdf/parti.pdf

[5] McDowall, S., Choi, Y 2010 J. Quality Assurance in Hospitality & Tourism 11 36.

[6] Baggio, R 2013 Tourism Planning & Development 10 217.

[7] Sinclair-Maragh, G., Gursoy, D 2016 *Tourism Planning & Development* 13 1

[8] Batta, R.N 2009 *Green Tourism Certification Manual.* Tokyo, Asian Productivity Organization (APO). Retrieved April 27, 2018, from http://www.apo-tokyo.org/00e-books/GP-18_GreenTourism.htm# contents.

[9] UNWTO 2017 World Tourist Barometer 15 1

[10] Othman, R. Salleh, N.H.M 2010 *J. Ekonomi Malaysia,* 44 93

[11] WTTC 2017 Travel & Tourism, Economic Impact 2017 Indonesia (World Travel and Tourism Council)

[12] Horwath HTL 2016 Market Analysis and Demand Assessment to Support the Development of Integrated Torism Destination across Indonesia (World Bank Selection #1223583)

[13] Davies, T., Cahill, S 2000 *Environmental Implications of the Tourism Industry* (Washington DC: Reources for the Future)

[14] Andereck, K. L 1993 Parks & Recreation (Arlington) 28 26

[15] Chun, S 2006 Int. J. Tourism Sciences 6 13.

[16] Henion, K. E 1976. *Ecological Marketing* (Columbus, Ohio: Grid).

[17] Furqan, A., Som, A. P. M., Hussin, R 2010 Theoretical and Empirical Researches in Urban Management 5(8 64

[18] Wight, P 1994 Environmentally Responsible Marketing of Tourism In *Ecotourism: a Sustainable Option?* Cater, E., and Lowman, G. (Ed.). Wiley: Chichester, pp. 39-53.

[19] Font, X. Tribe, J 2001 *Int. J of Tourism Research* 3 9.

[20] Dodds, R., Joppe, M. 2005 CSR in the Tourism Industry?, The Status of and Potential for Certification (Codes of Conduct and Guidelines. IFC).

[21] World Tourism Organization (UNWTO) and the United Nations Environment Programme (UNEP) 2012 *Tourism in the Green Economy – Background Report* (Madrid, Spain: World Tourism Organization)

[22] European Chemical Industry Council (Cefic) and European Communities Trade Mark Association (ECTA) 2011 *Guidelines for Measuring and Managing CO2 Emission from Freight Transport Operations*

[23] Department for Environment, Food & Rural Affairs (DEFRA) 2014 Guidelines for DEFRA/DECC's GHG Conversion Factors for Company Reporting

Implementation of Green Tourism Concept through a Dynamic Programming Algorithm to Select the Best Route of Tourist Travel

ORIGINALITY REPORT

13%	10%	6%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ocw.nctu.edu.tw Internet Source	3%
2	www.ijbmi.org Internet Source	3%
3	Anna Angela Sitinjak, Elvina Pasaribu, Justin E Simarmata, Tedy Putra, Herman Mawengkang. "The Analysis of Forward and Backward Dynamic Programming for Multistage Graph", IOP Conference Series: Materials Science and Engineering, 2018 Publication	1%
4	www.ecta.com Internet Source	1%
5	um.ase.ro Internet Source	1%
6	"STRONG TOURISM RESULTS IN THE FIRST PART OF 2017.", States News Service, July 13	1%

2017 Issue
Publication

7	Nicholson, T. A. J.. "Finding the Shortest Route between Two Points in a Network", The Computer Journal, 1966. Publication	1%
8	Submitted to Hong Kong Baptist University Student Paper	1%
9	Pooyan Sedarati, Sérgio Santos, Pedro Pintassilgo. "System Dynamics in Tourism Planning and Development", Tourism Planning & Development, 2018 Publication	1%
10	Submitted to University of Liverpool Student Paper	1%
11	www.eajournals.org Internet Source	1%

Exclude quotes	On	Exclude matches	< 1%
Exclude bibliography	On		

Implementation of Green Tourism Concept through a Dynamic Programming Algorithm to Select the Best Route of Tourist Travel

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8